subjects to the studies of the University and to other circumstances material to be considered. Those of the following, among other Chairs should, they think, be augmented, so that the lowest of them should be not less than 700*l*. nor the highest more than 900*l*. per annum—namely, Astronomy; Geometry; Natural Philosophy; Chemistry.

They would also assign stipends, varying between the same limits, to the following Chairs, constituted by division or modification of existing foundations:—Physics—dividing between these two Chairs the subjects of the present Chair of Experimental Philosophy; Physiology; Human and Comparative Anatomy—dividing between those two Chairs the subjects of the present Linacre Professorship.

Stipends varying between the same limits should also be assigned to the following new Chairs, which they think ought to be established—English Language and Literature; Pure Mathematics; Mechanics and Engineering.

The stipends of the following Chairs should, they think, be augmented, so that the lowest of them should not be less than 400*l*., nor the highest more than 500*l*. per annum—Medicine; Botany; Zoology; Geology; Mineralogy.

The evidence and opinions which the Commissioners have received lead them to the conclusion that it is expedient to develop as much as possible those branches of scientific instruction which are introductory and preliminary to medicine, rather than to attempt the establishment of a practical School of Medicine in Oxford.

It may be desirable to provide a reader in Human Anatomy, as assistant to the Professor of Human and Comparative Anatomy, with a stipend of from 250*l*. to 300*l*. per annum; and they think there should also be a reader (with a present stipend of 400*l*. per annum) in Invertebrate Anatomy, whose office, upon a vacancy in the Professorship of Zoology, should be united to that Chair, with such an increase in the emoluments of the professor as may make them equal to those of the Chair of Human and Comparative Anatomy, conditionally on his undertaking the additional duty.

Additional demonstrators appear to be required in several departments of natural science, who, in most cases may best be paid by fees, with supplementary grants when needful from the University chest.

There are several other purposes relative to the University which they regard as important, and for some of which definite provision ought to be made under the Act. Among these are:—

The foundation and endowment of scholarships or exhibitions tenable after a certain fixed period of residence in the University, for students in any special branches of study (including subjects which do not fall within the ordinary University course, such, for example, as medicine), which may be usefully promoted by such encouragement, under conditions properly adapted to make their enjoyment dependent upon the *bonâ fide* prosecution of such studies.

The encouragement of research, by the employment of properly qualified persons, under the direction of some University authority, in doing some definite work, or conducting some prescribed course of investigation, in any branch of literature or science; or by offering prizes or rewards for any such work or investigation.

The appointment and remuneration, from time to time, by the University authorities, of extraordinary professors or occasional lecturers in any subjects, either represented or not on the ordinary teaching staff of the University.

The last, and not the least important, of the main purposes relative to the University for which, in the Commissioners' opinion, provision should be made under the Act, is the creation of a common University fund, to be administered under the supervision of the University, in addition to its general corporate revenues.

They look to the creation of this fund (of which the formation must be gradual) as the proper resource for the supply of all the wants enumerated under the preceding head, except such of them as any college may propose to aid in supplying.

As to the sources from which funds for the above purposes should be obtained, they are of opinion that these funds must necessarily be obtained from the colleges.

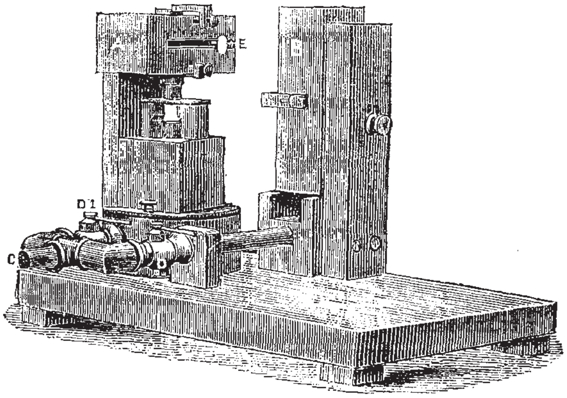
As to the principles on which payments by the colleges for the above-mentioned purposes should be contributed, it will be necessary to take into account the revenues, actual and prospective, of each college, and its actual and prospective wants for educational and other purposes, before they can form a judgment as to the amount which it should be called upon to contribute. They think it expedient to retain in Oxford a considerable number of prize fellowships (that is, fellowships not coupled with any specific duty or service to a college or to the University), for the encouragement and reward of meritorious students. Such fellowships should, they think, as a rule, be terminable; and their present impression is that their emoluments should be of uniform amount and should not exceed 200*l*. per annum.

The Commissioners have already received from some of the colleges proposals made, in a liberal spirit, in harmony with the views which they have expressed; and they are confident that they will receive such assistance from the University and the colleges generally, as may be necessary to enable them to determine when, and in what order of priority, provision shall be made for all the purposes specified in the first part of this statement.

AN IMPROVED METHOD OF PROJECTING LISSAJOUS' FIGURES ON THE SCREEN[1]

As is well known, the vibrations of tuning-forks when used for the production of Lissajous' figures, are kept up either by the constant application of the violin bow, or by the aid of an electro-magnet; the former method requiring the presence of two assistants, and the latter adding materially to the complexity of the apparatus, and not unfrequently failing to produce the desired result. The difficulty is overcome in the present apparatus by the substitution of harmonium reeds for the tuning forks, the entire instrument being easily controlled by one operator.

The apparatus consists of a base board on which are planted the two reed boxes A and B. The box A is placed horizontally in such a manner as to be capable of slight rotation in the horizontal plane, and also of adjustment in height, by means of the support to which it is attached being provided with a slot and set screw. The box B is permanently attached to the base board in the vertical position. The boxes are so placed that a pencil of light falling directly on E would be reflected to B about one inch from its top; they are furnished with clamping screws for the attachment of the reeds. The boxes are entirely open on the sides facing each other, their margins being covered with soft leather on which the reed plates bed, making a sufficiently air-tight joint. Wind is supplied through the brass tube C which gives off a branch to each box, a stopcock DD′ being inserted in each branch. The reeds are similar to those used in the construction of harmoniums; they are mounted on brass plates which fit the reed boxes. The tongue of each reed is furnished, at its free end, with a small reflector of microscopic covering-glass (E) silvered by Liebig's process, a piece of cork or pith being interposed between the tongue and the reflector, so as to free the latter from the frame of the reed; the reeds are then tuned in the usual manner. It is not necessary that the reeds should be in absolute tune, as, within certain limits, their relative vibrations can be adjusted by means of the stop-cocks, an advantage of great value, believed to be solely possessed by this apparatus.



The reed in the vertical box gives the fundamental ratio of vibrations from which the intervals are built up. Two fundamental reeds are used interchangeably, one giving the double or

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[1] Paper read at Lit. and Phil. Soc., Manchester, February 5, by J. Dixon Mann, L.K.Q.C.P.

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eight feet C of musicians, the other, being an octave lower in pitch, adds an octave to the intervals obtained from the first fundamental; thus, the third with the first fundamental becomes the tenth with the sub-fundamental. The horizontal box is furnished with a set of reeds giving all the intervals up to the twelfth, including the unison. The horizontal reeds are changed for the production of the different figures, the fundamental reed being retained.

A free space of half an inch was allowed between the supply pipe and the reed box, so as to afford a cushion of air capable of yielding to the elasticity of the tongue. The supply pipe is contracted at its termination to about one-third the size of the hole in the reed box through which the wind enters.

The apparatus is used as follows:—The base board being firmly clamped to a rigid table, one of the fundamental reeds is clamped in front of the box B: another reed, giving the desired interval, is similarly clamped to the box B; an elastic tube, about half an inch in diameter, is attached at one end to the pipe C, and at the other to an acoustic bellows. A fine pencil of light is now thrown on the mirror E, which is then adjusted by rotation of the box A until the light strikes the mirror of the vertical reed, from whence it is reflected on to a screen of tracing paper placed a short distance away; a condenser, interposed between the lantern and the mirror E, focuses the spot of light on the screen. On the bellows being put in motion the figure appears, and can be brought to a perfect stand in any phase of development, looped or cusped, by careful manipulation of one or other of the cocks. The entire apparatus should be as rigid as possible, and free from any vibration other than that produced by the tongues of the reeds, and also that the wind supply should be perfectly steady.

THE PARIS OBSERVATORY

As we announced some time ago, an important step has been taken for the reorganisation of the Paris Observatory. A decree of the President of the French Republic has appointed ten members of the new council of the Observatory, in pursuance of the provisions of the organic decree we referred to two months ago. The principal object of this new institution being to connect the observatory with the several large French administrations, three Government departments have sent two delegates each. The War Office is represented by Col. Laussedat, the director of the balloon service, and Commander Perrier, the chief of the Ordnance Survey; the Minister of Marine by two rear-admirals, one of them, M. Jurier de la Gravière, being a member of the late Council; the other is M. Clouet; the department of agriculture by M. Tisserand, Director of the National School of Agriculture, and M. Hervé Mangon, a member of the Institute and president of the Meteorological Society of France. The Academy of Sciences is represented by four members, carefully selected, viz., M. Dumas, the perpetual secretary, who is to be appointed president, and M. Liouville, the celebrated geometer, and two astronomers, M. Faye and M. Mouchez, both of them members of the Section of Astronomy. It must be noted that the Council of the Observatory, although vested with the right to present to the minister two candidates for the directorship of that establishment, are not to interfere with the solution of technical questions. A special council composed of all the astronomers *en titre* of the Observatory, are to meet once a month to solve them with the director of the Observatory. The first meeting of the Council of the Observatory took place on April 24, M. Dumas being in the chair. The members had been summoned in order to send to the Ministry a list of two candidates for the direction rendered vacant by the demise of M. Leverrier. The meeting was very short, and the members having been unable to agree, it was postponed to the 26th, when M. Faye wished to deliberate on the vexed question of the separation of meteorology and astronomy. This, however, was not allowed, when M. Faye protested and declared that he would bring the question before the Academy of Sciences at its next meeting, on April 29. After several scrutinies the Council decided to send in the names of MM. Mouchez, Loewy, and Tisserand as their nominees for the directorship of the Observatory, the last two having obtained an equal number of votes. Such was the result of the deliberations of the Observatory Council, which on the whole seem to have been conducted with becoming dignity. At Monday's sitting of the Academy, M. Dumas simply read M. Bardoux's letter, and summoned a meeting for to-day of a Committee of the Academy composed of all the sections in the mathematical sciences. A list of candidates will then be formed for proposal to the whole Academy, which will vote its candidates on May 5. It then remains with the Government to choose between the candidates proposed by the Council and Academy. M. Faye made no protest at the Academy meeting on Monday, though, our correspondent writes, he was expected to speak on the subject in a secret committee which met after the meeting of the Academy. We trust that throughout these important steps for the appointment of a successor to Leverrier all personal feelings will be suppressed, and the interests of the Observatory and of science alone considered.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, February 7.—"On the Diurnal Range of the Magnetic Declination as recorded at the Trevandrum Observatory," by Balfour Stewart, LL.D., F.R.S., Professor of Natural Philosophy at Owens College, Manchester.

The Observatory at Trevandrum was supported by His Highness the Rajah of Travancore, and its director was Mr. J. A. Broun, F.R.S., who has recently published the first volume of the results of his labours, giving the individual observations of magnetic declination, and deducing from them conclusions of great scientific value.

Amongst the other results published by Mr. Broun, are the diurnal ranges of the magnetic declination at Trevandrum for each civil day in the eleven years, 1854 to 1864.

In one respect the treatment of the declination observations at Trevandrum differs from that pursued at the Kew Observatory, inasmuch as in the former place, where disturbances are little felt, the diurnal ranges are from all the observations.

Variations of Long Period.

In order to investigate the long-period variation of the Trevandrum declination-range, I have treated these observations precisely in the way in which the Kew declination-ranges were treated (*Proc. Roy. Soc.*, March 22, 1877). By this method proportional values of the declination-range at Trevandrum have been obtained corresponding to weekly points for each year, and it is believed that these values are freed from any recognised inequality depending either on the month of the year or on the relative position of the sun and moon. If this method should be found to furnish nearly the same results in the case of two observatories so widely apart as Kew and Trevandrum, and with such marked differences in the annual variation of the declination-range, we may conclude that this separation of inequalities has been successfully accomplished.

The proportional numbers have next been dealt with precisely in the way in which the corresponding numbers were dealt with in the case of the Kew Observatory, that is to say, a set of nine-monthly values of declination-range have been obtained corresponding to similar nine-monthly values of spotted solar area.

The results of this treatment are exhibited in the diagram which accompanies this paper.

In Fig. 1 we have a curve representing the nine-monthly values of spotted area.

In Fig. 2 we have the Kew and in Fig. 3 the Trevandrum declination curve represented by nine-monthly values of the proportional numbers.

In Fig. 4 we have a curve representing the mean between the proportional numbers of Kew and those of Trevandrum.

From these figures it will be seen that a lagging behind the sun is a feature both of the Kew and the Trevandrum curves, while generally the prominent points in the Kew and Trevandrum curves agree well together in point of time.

On the whole it would appear that by taking the mean of the proportional numbers for the two stations, we get a curve that represents the solar curve better than one derived from a single station.

The whole period compared together represents both for the solar curve (Fig. 1) and the mean curve (Fig. 4), a series of three smaller periods, one extending from B to C and embracing the maximum; another extending from C to *c*, and a third from *c* to *e*; and this is as far as the observations common to both stations allow us to go in point of time.

It may be of interest to compare, by means of the tables, the period between the solar minimum of 1855 and that of 1867, with the period between the corresponding declination-range minima. The first of these declination minima occurred at Trevandrum (the

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